

國立中正大學機械工程學系 114 學年度第 2 學期教學大綱表

Syllabus - CNC Machine Tool Human Machine Interface Design and Application for PC NC Structure

課程名稱 Course Name	工具機 PC NC 架構之 CNC 人機介面 設計與應用	開課單位 Offering unit	機械工程學系/前瞻工程全英語學位學程 Dept. of Mech. Eng./Master program in Advanced Engineering		
	CNC Machine Tool Human Machine Interface Design and Application for PC NC Structure	課程代碼 Course code	4205162		
授課教師 Teacher	高永洲 Yung-Chou Kao 朴佑敘 Ayush Pratap	學分數 Credit	3	選修 Option	開課年級 Grades offered
全英文授課 EMI	<input checked="" type="checkbox"/> 是 Yes <input type="checkbox"/> 否 No			研究所(碩博) Master/PhD Students	

先修科目或先備能力：CNC、CAD、機械設計、Microsoft Visual Studio C#、視窗程式設計等。

Pre-requisites: CNC, CAD, Machine Design, Microsoft Visual Studio C#, Windows Programming, etc.

Overview: This course introduces the industrial CNC controller's system structure, its application principle, operation, human-machine interface (HMI) design tool, and development methods. Students can become familiar with the value-adding system development technology of industrial CNC controllers through this course, as they learn CNC HMI technology and understand the Microsoft Visual Studio integrated development environment. AI methods in machining, with case studies, will be utilized, with a special emphasis on trustworthiness, transparency, and alignment with engineering standards and physical laws. Talented students will be cultivated for the precision machine tool industry. Students can understand networking, HMI design, AI enhancement, and development methodologies.

Objectives: To cultivate students to be familiar with the design and development of industrial CNC value-adding systems, and also PC NC controller structures.

Textbook

1. Handouts and other printed information will be posted to eCourse 2.
2. Papers related to HMI and CNC Controllers.

教學要點概述

教材編選 teaching materials	<input checked="" type="checkbox"/> 自製簡報(ppt) <input checked="" type="checkbox"/> 課程講義 Lecture note <input type="checkbox"/> 自編教科書 Self-compiled textbooks <input type="checkbox"/> 教學程式 Program <input checked="" type="checkbox"/> 自製教學影片 Videos <input checked="" type="checkbox"/> 其他 Others
教學方法 teaching methods	<input checked="" type="checkbox"/> 講述 Narrative <input checked="" type="checkbox"/> 小組討論 Team <input checked="" type="checkbox"/> 學生口頭報告 Report <input type="checkbox"/> 問題導向學習 PBL <input type="checkbox"/> 個案研究 Case Study <input checked="" type="checkbox"/> 其他 Others
評量工具 Evaluation tools	<input type="checkbox"/> 期中考 Midterm Exams <input type="checkbox"/> 期末考 Final Exams <input type="checkbox"/> 隨堂測驗 Quiz <input checked="" type="checkbox"/> 隨堂作業 In-class assignments <input checked="" type="checkbox"/> 課後作業 Homework <input checked="" type="checkbox"/> 期中報告 Interim Report <input checked="" type="checkbox"/> 期末報告 End-of-term report <input type="checkbox"/> 專題報告 Special Report <input type="checkbox"/> 評量尺規 Evaluation <input checked="" type="checkbox"/> 其他 Others
教學資源 teaching resources	<input checked="" type="checkbox"/> 課程網站 e-Course 2 <input checked="" type="checkbox"/> 教材電子檔供下載 Electronic Lecture Notes <input type="checkbox"/> 實習網站 Internship website
教師相關訊息 instructor's information	Professor Yung-Chou Kao and Dr. Ayush Pratap

單元主題 Theme	內容綱要 Outline	分配時數 Hours				可達成核心能力 Achievable Core Capability
		講授 Class	示範 Demo	習作 Practi	其它 Other	
Introduction	Introduction of Machine Tool Precision machinery	9				D1, D2, D4, D8

CNC structure	Industrial CNC PC NC structure	9				D1, D2, D4, D8
Human Machine Interface	Essentials of Colors and Beauty Basics on Human Machine Interface	9				D1, D2, D4, D8
Networking	Network Programming Networking with CNCs	3	3	9		D1, D2, D4, D8
Case Study	Industrial case study		3			D1, D2, D4, D5
Team work	Team-based project Development and Implementation			9		D1, D2, D3, D4, D5, D8
可達成核心能力 Achievable Core Capability		核心能力達成指標 Core capability achievement indicators				
D1	具機械與光機電整合工領域之專業知識	具備機械加工所使用之 CNC 工具機架構基本知識。(Possess basic knowledge of CNC machine tool architecture used in machining.)				
D2	策劃及執行機械及光機電整合工領域專題研究之能力	瞭解 CNC 工具機操作之人機介面並具備團隊合作規劃友善 CNC 人機介面之專業領域研究之能力。(Understand the human-machine interface of CNC machine tool operation and possess the ability to collaboratively plan and conduct research in the professional field of user-friendly CNC human-machine interfaces.)				
D3	撰寫科技論文與簡報之能力	透過分組以團隊運作方式探討 PC NC 系統架構並整理與撰寫專題報告，培養專業論文之撰寫能力。(By working in groups to explore the PC NC system architecture and compile and write special reports, students can develop their professional paper writing skills.)				
D4	創新思考及獨立解決機械與光機電整合工程問題之能力	藉由團隊會議腦力激盪思考 CNC 創新人機介面並尋求可行之解決方案與完備解決機械加工之附加值功能的能力。(Through team meetings, brainstorm innovative human-machine interfaces for CNC machining and seek feasible solutions and the ability to fully address the value-added functions of machining.)				
D5	跨領域人員協調整合之能力	經由團隊之運作培養與不同專業領域人員的溝通能力與協調合作統合能力。(Through teamwork, cultivate communication, coordination, and integration skills with people from different professional fields.)				
D8	終身自我學習成長之能力	透過學習國內外各式 CNC 控制器之架構培養主動學習態度建立終身自我學習成長之能力。(By studying the architecture of various CNC controllers from both domestic and international sources, we cultivate a proactive learning attitude and build lifelong self-learning and growth capabilities.)				

Notes:

上課時間 Class Time	上課地點 Classroom	諮詢時間 Office hour	教學品質評量方式 Evaluation
Monday 14:10~17:00	Innovation Building Room 202	Wednesday 09:00~12:00 Room: 531A Tel: 2720411 # 33307 E-mail:imeyckao@ccu.edu.tw	A questionnaire is used to investigate the lecturing and student learning outcomes
週次 Weeks	教學與作業進度 Teaching and Homework Progress		備註 Remarks
Weeks	Course Outlines		Remarks
1	Introduction of precision machinery		
2	Introduction of industrial CNC such as A-LNC, SYNTEC, DELTA, FANUC, etc.		HW#1
3	Introduction of the CNC operating system		
4	Introduction of the CNC framework and principle		HW#2
5	Team project starts		Understand industrial CNC Operation practice
6	Introduction of HMI applications		Colors, principles of beauty, etc.
7	Introduction of HMI design tools - iHMI		Microsoft Visual Studio IDE HW#3
8	Introduction of HMI design tools – CNCs in general		HMI layouts
9	Mid-term exam and/or report		Personal report
10	Practices on HMI – CNCs such as Syntec		Visual Studio C#
11	Practices on HMI – CNCs such as Fanuc		HW#4
12	Introduction of networked applications - CNCs		
13	Introduction of tools – CNCs, in general		HW#5
14	Term project design, development, and implementation		HMI design and development
15	Term project design, development, and implementation		HW#6
16	Term project design, development, and implementation		HMI design and development
17	Term project design, development, and implementation		HMI design and development
18	Term project report, presentation, and submission		Team-based final report

Others: 本課程以全英文授課。English is the official language in this course